IMPERIAL BUREAU OF
4 JUN 1928

EMPIRE COTTON GROWING CORPORATION.

REPORT OF THE ADMINISTRATIVE COUNCIL OF THE CORPORATION ADOPTED AT THE SEVENTH ANNUAL GENERAL MEETING ON MAY 16TH, 1928.

The year dealt with in this Report is the last of the period of five years covered by the Cotton Industry Act, 1923. This Act, which provides for the payment of the spinners' levy, expires in July of this year, and the Corporation have therefore had to consider very carefully what steps should be taken to ensure the continuity of their work.

The Federation of Master Cotton Spinners' Associations and the Cotton Spinners' and Manufacturers' Association have investigated the whole question very thoroughly, and, while recognising the present difficulties of the Cotton Industry, they were strongly of opinion that the Corporation's work ought not to be allowed to lapse. They came to the conclusion, however, that a reduction in the rate of the levy from 6d. to 3d. a bale of 500 lbs. would not seriously handicap the essential work of the Corporation and would at the same time ease the spinners of a burden which, during the present period of depression, was by no means inappreciable. The reduction of the Corporation's income from this source may render impossible any considerable expansion of its programme during the next few years, but by drawing on its reserves, if necessary, no curtailment of its present activities will be necessitated.

The fact that mills owning over 81 per cent. of the spindles controlled by members of the Federation and the Association have voted in favour of renewing the levy at the reduced rate is a striking example of the far-sighted view

taken by spinners, even in circumstances of unparalleled difficulty, towards this important and fundamental question of broadening the basis of the supply of their raw material.

The new Bill was introduced by Mr. G. B. Hurst, M.P., who sponsored the former Bill in 1923, and it passed through the House of Commons on April 27th. It is confidently expected, therefore, that it will become law on July 18th, when the present Act expires.

The work done during the year 1927–28 in the various Empire cotton-growing areas, and the other activities of the Corporation in the same period, are recorded below.

In addition, it has been thought that it might be useful to summarise the present position in the several countries at the expiry of the first five years of the Corporation's full working since the passing of the Cotton Industry Act in 1923, setting out briefly the main lines upon which satisfactory progress can be recorded and the principal difficulties that have been encountered. This summary is issued as a separate document and is circulated to all members of the Corporation with this Annual Report of the past year's work.

PERSONNEL.

During the past year the Council have had to record with deep regret the death of Mr. A. Sidebottom, one of the representatives of the Federation of Master Cotton Spinners' Associations, and of Mr. J. C. Parker, the representative of the United Textile Factory Workers' Association. The latter was also a member of the Executive Committee. It is also regretted that Mr. V. A. Grantham, the representative of the Bombay Chamber of Commerce, has resigned from the Council.

The term of office of the President and Vice-Presidents expired last year, and they were all unanimously re-elected for a further period of three years.

Under the terms of the Charter the bodies, other than overseas Governments and the Imperial Government Departments who have power of nominating members on the Council,

were informed that their representatives had held office for the maximum period of three years, and were asked if they desired to renominate their old representatives or to submit new names. At the time of writing this Report the nominations have not all been received, but it is already clear that very few changes in the personnel of the Council will be made. The Federation of Master Cotton Spinners' Associations and the Cotton Spinners' and Manufacturers' Association, having asked that certain of their members, in addition to their present nominees, should be associated with the work of the Corporation by joining the Council, that body will accordingly be invited at the meeting to which this Report is submitted, to co-opt additional representatives of the Federation and of the Association.

The Council are glad to avail themselves of this opportunity of extending their congratulations to those of their members and to others associated with the work of the Corporation in various ways whose names appeared in the New Year's Honours List. They include Lord Lugard, one of their Vice-Presidents, who received a peerage ; Sir Algernon Aspinall, Secretary to the Governing Body of the Imperial College of Tropical Agriculture, Trinidad, who received a knighthood ; Major R. G. Archibald, Director of the Wellcome Tropical Research Laboratories, Khartoum, and Mr. O. T. Faulkner, Director of Agriculture, Nigeria, who received the C.M.G.

INDIA.

The Royal Commission on Agriculture, which was appointed in 1925, is now, after two years of enquiry and investigation, employed in preparing its report, the publication of which is expected at an early date. The scope of the Committee's enquiry was exceptionally wide, covering practically the whole range of agriculture, with the exception of land tenure, revenue assessment and irrigation charges.

It is anticipated that among the many important recommendations which are bound to result from so comprehensive

an enquiry, those relating to marketing and research are likely to find a specially prominent place.

Both these problems in their special relation to cotton have been consistently kept in view by the Indian Central Cotton Committee during the past year. On the research side, the labours of the Committee have followed two main divisions : the first relating to the evolution of better strains, to which five investigations have been devoted, the second to the combating of diseases and pests, three enquiries dealing with diseases and two enquiries with pests. In regard to new varieties, the report of the Committee rightly emphasises the necessity for patience ; only one cotton generation can be produced in a year, and a period of from three up to eight years may be required before a new variety can be definitely fixed. It can be easily recognised, therefore, that the substitution on a field scale of an improved variety is a matter of considerable time. Wilt disease and the pink and spotted bollworms were the chief diseases and pests investigated, and an investigation carried out by the Agricultural Department of the Central Provinces has reached the stage at which 7,500 lbs. of seed of a cotton highly resistant to wilt has been distributed to selected growers.

On the marketing side there has been considerable progress during the year. An experimental market was opened in Indore State, one of the chief features of which was the representation of cotton growers on the market committee. This was so successful that it is to be followed by four similar markets at other important centres in the State. A Bill on the lines of the law already in force in Berar was introduced and passed in the Bombay Legislative Council. Important developments dealing with matters relating to standards, contracts and wholesale cotton grading are under discussion in Karachi. The Indian Central Cotton Committee, in co-operation with the local Agricultural Departments concerned, are carrying out detailed investigations into the financing and marketing of the cotton crop in the Bombay and Madras Presidencies, Sind and the Punjab.

The Indian Cotton Transport Act, which aims at the prevention of the mixing of different staples of cotton and so enables protected areas to maintain definite standards for quotation, remained in force in the same areas in British India mentioned last year, viz., six zones in Bombay and three zones in Madras. Similar legislation is in force in Baroda and Rajpipla States. During the year action was taken on similar lines in Chota Udaipur and Hyderabad States. The difficult question of the fixation of a protected zone for the Central Provinces and Berar still remained undecided by the close of the year.

The Cotton Ginning and Pressing Act continued, on the whole, to work satisfactorily. Under the provisions of the Act, all bales have to be marked in such a way that unsatisfactory cotton can be traced to its source through the pressing factory. Bales not marked in accordance with the Act are, moreover, declared by the by-laws of the East India Cotton Association to be "not a fair tender," and hence are liable to rejection. There was in some places a considerable recrudescence of the suicidal practice of watering of cotton, prompted perhaps by the very low prices which prevailed during the opening part of the year. With this abuse the Cotton Ginning and Pressing Act is not capable of dealing directly, and the necessity of supplementing its provisions by further measures is receiving consideration.

The subject of cotton intelligence continued to receive attention. The reintroduction of the rail-borne traffic returns for exports of cotton by trade blocks was effected from October 1926, but for the purpose of testing the estimates of production, import figures are also required, and a request for the publication of the latter has been made to the Government of India. The cotton press returns have been found a very useful check on provincial estimates, and cases of substantial errors in these forecasts have been by their aid brought to the notice of provincial authorities, enabling the latter to locate the sources of the errors. Until, however, all native states introduce such returns, a full check on Indian cotton

cannot be obtained. In this connection it is satisfactory to note that eleven states are now publishing returns against eight last year.

Changes, if any, subsequent to the publication of the final forecast in February are now brought to the notice of the Director-General of Commercial Intelligence in April. Lastly, the large import of American cotton, for which last year was remarkable, necessitated the publication of reliable information regarding such movements. Weekly information was accordingly obtained and published from voluntary advices received from importers, showing the amount of such cotton purchased, arrived and at sea.

The cotton cultivator has had a distinctly brighter season in 1927-28 than in the previous year in relation both to price and yield. The final official forecast for this season's crop, published in February 1928, showed an area of 23,812,000 acres and an output of 5,480,000 bales, compared with 24,676,000 acres and an output of 5,003,000 bales last year. Unofficial estimates are inclined to think that the Government figure is too low, and to place the total crop in the neighbourhood of 6,000,000 bales. The official forecast would undoubtedly have been higher but for unpropitious weather met with late in the season.

Mr. Burt, who has been Secretary of the Indian Central Cotton Committee for the past seven years, has recently resigned this post on appointment as Director of Agriculture, Bihar and Orissa. The Corporation are glad of this opportunity to place on record their appreciation of the readiness which Mr. Burt has always shown to co-operate in all phases of their work. He has been succeeded by Mr. J. H. Ritchie, formerly for some time Deputy Director of Agriculture in the Central Provinces.

AUSTRALIA.

When the last Annual Report was written, the season 1926–27 had been unfavourable for cotton in Queensland ; dry conditions had lasted until the end of September, and from then onwards there was practically no more rain until mid-December. December, January and March, on the other hand,

were excessively wet, while after a welcome dry spell in April and May over three inches of rain fell in a single day in June at Biloela, where the Experiment Station is situated. Cotton-growing was thus subjected to a severe test as to its resistance to extremes of both drought and rain. On the whole the results were by no means unsatisfactory. It is true that there was a considerable fall in the production, but this is attributed locally largely to the industrial uncertainty which marked the transitional period between Government control and the Pool Board, and to the low cotton prices then ruling. The marketing arrangements for the crop are now in the hands of a Pool Board which is responsible for handling and financing the crop from the time that it is put on the rail as seed cotton. In 1926–27 also the Commonwealth Government began to give bounties on seed cotton, and it was reported that under this system the Pool Board sold the whole of the crop within the Commonwealth at higher prices than could be obtained overseas. The bounties paid on seed cotton amounted to £7,000 on a total crop of 5,879 bales of 400 lbs.

In spite of the adverse climatic conditions last season, the returns received by growers appear to have been so far satisfactory that it is estimated the acreage has been increased from 21,000 to 35,000 acres.

At the same time it appears from statements in the Press that the cotton mills in Australia will be unable, owing to trade depression and external competition, to take even as much cotton as last year, and that, in these circumstances, the greater part of the crop, which is estimated to be double that of last season, will be exported, as in years prior to 1927.

Mr. Ballard, the Corporation's Cotton Entomologist attached to the Commonwealth Government, returned home in September last on completion of his 3½ years' tour, and letters have been received from Mr. Bruce, Prime Minister of Australia, and from Mr. Forgan Smith, Acting Prime Minister of Queensland, expressing their appreciation of the assistance which Mr. Ballard was able to give during his tour of service. During this time he was successful in devising a method of limiting

the damage done by the corn-ear worm, one of the chief cotton pests in Queensland, by planting the cotton early and using a trap crop of maize. He also made an intensive study of two other major pests, viz., *Tectacoris lineola* and the cotton stainer (*Dysdercus spp.*). The former can be easily controlled by handpicking, but no successful means of combating the latter has yet been devised.

On the termination of Mr. Ballard's period of service, the only immediate and direct interest in Queensland which the Corporation still retain lies in the Experiment Station at Biloela, to which as arranged they make an annual contribution, which terminates in 1929. The account of the work of this Station which appeared in the Corporation's annual volume of Reports from Experiment Stations, shows that experiments are being carefully carried out on points which are of immediate practical importance to cotton growers, such as crop rotations, time of planting, height of thinning, the value of ridging, etc. It is to be hoped that the results will be adopted by farmers in the neighbourhood and in other parts of the country who appreciate the value of the guidance thus afforded to them through the Experiment Station.

Writing early in February, the Cotton Specialist was of opinion that the climatic conditions up to then had been extremely favourable. In some parts a very heavy infestation of corn-ear worm, which originated in fields of stand-over cotton, had unfortunately caused heavy loss to adjacent fields. On the research station the crops were in excellent condition. The total estimated area under cotton in Queensland is 26,000 acres.

SOUTH AFRICA.

A visit was paid to South Africa last spring by Mr. Addison, Sir James Currie and Mr. Jefferys, and a report on this tour of inspection was issued on their return, copies being sent to all members of the Corporation and to all spinning firms. The visit took place during the harvest of a crop that had, save in a few places, suffered very severely from drought. In the

Empangeni District, it is true, crops were seen yielding not less than 1,200 lbs. of seed cotton per acre, but such cases were only isolated examples and in most places the lack of rain, while showing up the drought-resistant properties of the cotton plant, resulted in a very poor yield, while damage from jassid reduced the crop still further. These conditions served to show up to more than ordinary advantage the success that has attended the efforts of Mr. Parnell, the Corporation's Plant Breeder at Barberton, to breed a jassid-resistant strain. Mr. Parnell's report on his work last season has already appeared in the publication that has been circulated, entitled " Reports received from Experiment Stations, 1926–27," in which were included also reports from Mr. Wood and Mr. Parsons. All three reports refer to a stretch of country lying to the East of the Drakensberg from Barberton in the North to the Mkusi River in Zululand, a distance of about 160 miles. This embraces the major part of the low veldt cotton area for which the Corporation, at the request of the Union Government, have undertaken to create a nucleus seed supply of strains suited to local conditions. The main breeding operations are conducted by Mr. Parnell at Barberton ; Sub-Stations have been opened in Swaziland and North Zululand, where new strains are tested and an attempt is being made to obtain as thorough an acquaintance as possible of local climatic and soil conditions, the incidence of pests and disease, and of farming conditions in general.

The dry season put everything to the test as regards drought resistance, but there was little chance of making as much of the opportunity as might have been done, owing to the irregularity of growth. Two very important observations, however, were made—firstly, the difficulty of the freer and bigger bolled types in making headway under dry conditions, and, secondly, the remarkable performance of two strains, U.4 and A.12, under the most trying circumstances imaginable. Both strains managed to set bolls in the dry weather preceding the February rains, and the enormous advantage of an early bolling variety was reflected in the final yields.

It would appear that, as a result of the exceptionally dry year, two really useful cottons for the drier areas have been discovered.

The chief work of the Sub-Stations in North Zululand and Swaziland was the testing and multiplication of the new jassid-resistant strains produced at the Barberton Station. Owing to the urgency of the seed question it had been decided that multiplication must be kept abreast of the testing work, so that there might be no delay in issuing seed in the event of any of the strains proving satisfactory under trial in the districts. The bulk seed from Z.1, a noted jassid-resister, was accordingly grown in the districts for the dual purpose of trial and multiplication, mainly under the control of Mr. Wood and Mr. Parsons. It was thus possible for the first time to test a strain, built up from the point of view of jassid resistance, outside the Breeding Station. There were three specific points to be decided :—(1) How would the strain behave as regards jassid—would it be better or worse than at the Barberton Station ? (2) Would the lint preserve its qualities ? (3) Apart from jassid resistance, would it show up any specific advantages or disadvantages under new conditions ?

As seed was scarce it was planted by hand, mostly one seed per hole, over a few hundred acres. Ill-luck pursued it from the beginning, Mr. Parsons losing his best field of 70 acres through damage by hail, and, finally, a very promising lot was similarly destroyed at Barberton. But the remainder did remarkably well ; so well, indeed, that the whole of the bulk seed has been since issued to growers and the re-selections are being multiplied under the Corporation's control for issue next year.

The results of the multiplication plots showed that :— (1) Jassid-resistance was fully maintained. (2) The quality of the lint was well maintained also. In the picking season it was possible to take advantage of the opinion of Mr. H. C. Jefferys, who accompanied Sir James Currie on his South African tour, and he stated that Z.1 lint showed remarkable

strength. Further, Z.1 lint obtained the highest price at Durban of any Swaziland cotton. (3) As regards advantages or disadvantages apart from jassid-resistance, nothing special was noticed.

The question of the control of jassid so far as cotton is concerned appears thus to be in a fair way to solution through growing resistant strains, seed of which will, it is hoped, be available in large quantities for next season.

With the control of jassid practically assured, boll worms are the most serious cotton pests in South Africa at present. It may be hoped that the elimination of jassid and the ability of the plant to set a useful top crop will mitigate the damage done by boll worm in the low veldt, where the combination of the two pests had become a very serious limiting factor in cotton growing. The increase in the red boll worm population, however, is undoubtedly a serious matter and any steps calculated to reduce its numbers would be welcome. In last year's Report mention was made of the probable value of ratoon or stand over cotton as a trap crop for the red boll worm. This method was given a trial last season on one of the farms of the Spelonken Cotton Syndicate, where ratoon cotton proved itself a very effective trap crop. Two results may be noted: Firstly, there is a very great reduction in the red boll worm population amongst the current year's young crop. Secondly, it is necessary, in order to give the protective measures the best chance of succeeding, that a rapid bolling cotton, such as Barberton, U.4, should be grown in preference to the slower, big bolled varieties. Mr. Milligan has strong hopes that a combination of trapping with the growing of a suitable variety will mitigate, to a very considerable extent, the damage done by the red boll worm.

The season 1927–28 opened well in the Eastern Transvaal. The early rains were plentiful and the conditions favourable until the end of February, when rain began to be needed. The acreage in this district is an increase on that of last year, but is less than it might have been as many farmers have reduced their area under cotton until such time as they

may be supplied with improved jassid-resistant seed. A large number have now small areas under Z.1, and a few have U.4, both being strains produced by the Corporation's plant breeder at Barberton. These are both doing well this season, and are attracting attention from farmers who had previously been apathetic. There is only a small proportion of ratooned cotton in this part of the country, which did well in the early part of the season but later was mostly destroyed by jassid.

In Natal the area under cotton was estimated at 35,000 acres, 50 per cent. of it being ratooned. The rainfall and its distribution were good in the early part of the season, and generally similar to that of the seven years prior to the seasons 1925–26 and 1926–27. There had unfortunately been insufficient labour to cope with weeds in some parts, and in certain districts jassid was widespread and abundant, especially in the ratooned cotton, but the latter was in February sufficiently advanced for Mr. Parsons to write that a reasonably good crop should be expected.

The red boll worm attacked the ratooned crops severely early in the season, but the infestation has been unusually mild during the last three months. It is believed that the practice of cutting down the crop and grazing it off in October and November reduced the infestation considerably, and it is hoped that the crop will not now suffer heavily. In this area about a thousand acres of jassid-resistant cotton from seed supplied by Mr. Parnell were all green and healthy early in March, and were expected to yield heavily.

SWAZILAND.

Mr. Wood continued his experimental work on lines similar to those of the previous season. Most of the trial plots at the Barberton Experimental Station were duplicated on land placed at his disposal by Cotton Plantations Ltd., at their Ingwavuma estate. The success of these plots was most striking, and indicated the future possibilities of cotton-growing in Swaziland under good farming conditions once the seed supply is secure.

Yields of some 1,000 lbs. of seed cotton to the acre were obtained from some of the half-acre plots, and the seed was utilised for general distribution at the commencement of the current season under the name Barberton 1.

A considerable number of possible rotation crops were planted experimentally, but the season proved too dry for satisfactory results. The crops that seem to offer most prospect of success are bulrush millet, groundnuts, hluba and soy beans and sesamum.

In July last Mr. Wood was offered the post of Professor of Agriculture at the Imperial College of Tropical Agriculture, Trinidad, and the Corporation released him from his contract in order that he might take up this appointment. Mr. MacDonald, who held a Studentship from the Corporation at the Trinidad College, was appointed to succeed him, and arrived in Swaziland in September.

This season the climatic conditions throughout the greater part of Swaziland have been decidedly favourable. Planting rains were good, especially in the low veldt. In some parts as much as 16 inches fell in January, but this was only in certain areas, and the damage to the crop is not widespread. Red boll worm has caused little trouble, but jassid infestation, though not yet serious, is general.

About 8,000 acres are under cotton, and of these roughly 300 acres, scattered throughout the country, are under Mr. Parnell's jassid-resistant seed from Barberton. This area has shown no signs of jassid attack.

During the early part of the season labour was very scarce, and this is a problem that will need to be seriously considered before any extension of the area under cotton can be advocated.

SOUTHERN RHODESIA.

The all important question at present in this Colony is that of seed supply. Major Cameron's efforts, both amongst the settlers and at the Cotton Breeding Station at Gatooma,

have been chiefly concentrated on this point. It was hoped that, of the strains that had been tried at Gatooma in 1925–26, one would in the succeeding season prove sufficiently superior to the commercial Improved Bancroft to justify its multiplication and issue. None of the varieties, however, showed sufficient jassid-resistance to warrant its being grown in bulk during the current season, and further trials are being made with a number of strains which showed good resistance to the attacks of this insect. Some 250 acres, representing half the area allotted to the Station, have now been cleared, stumped and ploughed, so that the work can be carried out without being hampered through lack of land. Last year 60 acres were under cotton, 74 under maize, 6 acres under trap crops, and $5\frac{1}{2}$ acres under groundnuts. The mean yield of maize for the Station was 10.9 bags of 200 lbs. each per acre, and at the Colony's leading maize show at Salisbury two first and two second prizes were won.

Here, as in parts of the Union of South Africa, the limiting factor has been the jassid, and whatever variety is ultimately selected for issue must be primarily jassid-resistant, whatever its other qualities may be.

The work done by Mr. Parnell, at Barberton, and by Mr. Peat, at Gatooma, has pointed the way to the production of jassid-resistant strains ; but the results must be confirmed and tested by large scale cultivation throughout the country, and this will take another two years in Rhodesia.

Major Cameron is aiming at a staple of $1\frac{1}{8}''$–$1\frac{3}{16}''$, which is a very desirable type of cotton for Lancashire's requirements ; at the same time, at a conference which Major Cameron had with the Executive Committee while on leave, it was suggested to him that he might find it easier to achieve a jassid-resistant cotton of $\frac{7}{8}''$ to $1''$, which, if it were a heavy yielder with a high ginning outturn, would give just as good returns to the grower as a longer stapled cotton with a smaller yield ; the Committee were able to assure him that cotton of this staple length would realise satisfactory prices, provided

that it was of good colour and quality, as difficulty was frequently experienced in obtaining good American cotton of this length.

Only a very small acreage of cotton is being grown in Southern Rhodesia this year. To date in most districts the season for cotton has been favourable, although maize and the later planted tobacco in many districts are suffering severely from the effects of a dry spell. The Gatooma district especially is suffering from drought effects. The cotton on the Station, however, is standing up splendidly and shows little sign of having suffered. Several jassid-resistant strains look markedly promising. Growth in the commercial crops has been fair, but jassid is much in evidence and the symptoms of attack are already obvious. It is probable for this reason that yields will again be very low, and the quality of the lint generally poor.

Marketing difficulties in the tobacco industry and the serious effects of the present drought on the maize and tobacco crops are causing increased interest in the possibilities of cotton as a crop for the country. Small plots of Cambodia in the various districts, from seed distributed to demonstrate jassid-resistance, are being tended with great care, and there is keen interest in the progress of the Corporation's work at Gatooma.

NORTHERN RHODESIA.

The Colony was included by the Director in his South African tour last year. On his arrival in June he found that there would be a severe shortage of cotton seed for the 1927–28 season. He accordingly tried to arrange that six tons of seed should be procured in South Africa for distribution to those Northern Rhodesian settlers who were in need of it. It was impossible to secure seed of good quality in the Union, owing to the local demand for the small amount of good seed that was available, but six tons of the best seed obtainable in Southern Rhodesia was purchased by Major Cameron on the Corporation's behalf, and forwarded to Livingstone. It was pointed out to the local settlers that this seed could not be considered as in

any way jassid-resistant, but it was distributed by the Agricultural Department free of cost, on the understanding that all planters who should obtain a reasonable crop would refund to the Corporation, through the Department of Agriculture, the cost of the seed they had received. The total cost of the seed delivered at Livingstone amounted to £40.

Mr. Salter, the Corporation's agricultural officer in the Colony, has unfortunately been forced to relinquish his appointment after two years' service, owing to an attack of rheumatic fever. The Corporation have, however, made themselves responsible for half the salary of an agricultural officer, Mr. Moffat, who has been stationed in the Abercorn District, after spending a year at the Corporation's Experiment Stations in Nyasaland as the holder of a Studentship. The balance of Mr. Moffat's salary is paid by the Northern Rhodesian Government.

Progress is being made in the establishment of the Government Research Station at Mazabuka, where Mr. McEwen, formerly a member of the Corporation's staff in Tanganyika and Nyasaland, is in charge of the agricultural side of the work.

It will be remembered that in order to assist farmers who were in difficulties owing to the failure of the cotton crop in 1925–26, the Corporation shared equally with the Northern Rhodesian Government in providing between them a sum of £9,500 from which advances were made by a Committee appointed by the Government after investigating any claims put forward. These advances are gradually being repaid, and the Corporation have so far received £1,625 on this account.

ANGLO-EGYPTIAN SUDAN.

The retirement of Sir George Schuster from Sudan Administration on his appointment as Financial Member of the Council of the Viceroy of India, is a serious loss to that country, in the welfare of whose people he took so whole-hearted an interest.

In the season 1926–27 over 100,000 feddans were cultivated with cotton in the Gezira and the average yield again reached a high figure, viz., 4.7 kantars per feddan, with a total crop of over 112,000 bales of Sakel, while 22,300 bales of the same variety were grown outside the Gezira. In addition, 9,100 bales of American cotton were grown under irrigation and 4,700 bales under rainfall.

This season the area under cultivation in the Gezira has been extended westwards : 105,000 feddans were under cotton in 1927–28, while it is hoped to increase this to 135,000 next season.

The Kassala Cotton Company, in which the Corporation hold a substantial interest, have made arrangements with the Sudan Government whereby they are exchanging their concession in the Gash Delta for another of 45,000 feddans in the Gezira, adjoining the land managed by the Sudan Plantations Syndicate. Conditions in the Gash Delta were found to be such as to make it impossible to bring under cotton such large areas as were originally anticipated.

The appearance of exportable quantities of rainfall cotton from the Sudan is especially noteworthy. Unfortunately the rains have been very poor in the south this season, and the Government estimate of the crop is less than 5,000 bales. The Government have had to surmount serious difficulties before they could advocate a wide extension of this crop among the natives of the Southern Sudan. Chief among these were the provision of ginneries and transport, upon the adequacy of which would depend the price that could be paid to the native cultivator. In this connection it is reported that in some of the districts in the South the natives are now taking a decided interest in the crop, having grasped the fact that by growing sufficient cotton they can pay their taxes without having to part with any of their cattle—a powerful piece of propaganda for cotton-growing among these people. Details of this most interesting and important development in the Sudan have appeared in the *Empire Cotton Growing Review*, Vol. III, No. 4, and Vol. V, No. 1. In the first Report on the Sudan

since his appointment, Sir John Maffey, the Governor-General, states that, according to the results achieved up to the present, it appears that with a price of 7½d. a lb. for Middling American in Liverpool, production of rain-grown cotton in the Southern Sudan can be carried on with a reasonable margin of profit.

An important event in the development of the growing of cotton under rainfall in these Provinces is the announcement that now that the new railway from Kassala to Gedaref is nearing completion, the Government have decided to proceed immediately with its extension to Makwar, a distance of 145 miles. Cotton from the Nuba Mountains, Mongalla and the Upper Nile is at present carried by river, camel or motor transport to the railway at Kosti on the White Nile. The new railway extension will enable it to travel thence via Makwar direct to Port Sudan. At the same time it will open up the country between Gedaref and the Blue Nile, which is a potential cotton-growing area.

Expansion of the work carried out by Mr. Bailey, the Corporation's plant breeder, partly due to experimental work in connection with rain-grown cotton in the South, has necessitated the appointment of a second assistant and Mr. F. E. Kenchington, a former holder of one of the Corporation's Studentships, was appointed. Mr. Bailey's interesting report, including the extension of his work as mentioned above, is contained in the annual volume of Reports from Experiment Stations published in February.

The personnel of the London Committee for the co-ordination of agricultural research in the Sudan, of which Sir James Currie is Chairman, has undergone modification, Mr. Arthur Huddlestone, Financial Secretary, succeeding Sir George Schuster. The representatives of the Sudan scientific organisations will consist of Major Archibald, Director of the Wellcome Tropical Research Laboratories, Mr. Davie, Director of Agriculture, and Mr. Hewison, Agricultural Adviser in the Gezira. In addition, the following have been appointed as technical assessors: Dr. E. J. Butler, Mr. F. L. Engledow and Dr. E. M. Crowther.

On the recommendation of this Committee the Government are appointing a plant physiologist and an additional entomologist in the Sudan.

The collected reports on the research work bearing on agriculture in the Gezira for the season 1926–27 have been printed and published ; the work of editing them and preparing them for the Press was entrusted by the Government to the Secretary of the Corporation. The volume forms a record of work which is probably unique in the sphere of tropical agriculture under irrigation.

This season the climatic conditions have been unfavourable in most parts. In the Gezira the Government report that the crop will be smaller than in the last two years, the estimate being 360,000 kantars, or approximately 85,500 bales of 400 lbs., as compared with 113,000 last year. Black Arm is reported to have done much damage, while " sooty mould " (*Cladisporium sp.*) is believed to have been harmful also.

In Tokar and in Kassala the prospects are good; from the former a crop of 12,000 bales is expected, and from the latter, about 12,500 bales.

A crop of nearly 12,000 bales of irrigated American cotton is expected, and, as mentioned above, about 5,000 bales of rain-grown American.

UGANDA.

The season 1927-28 has been characterized by extremely hot, dry weather since October, especially in the Eastern Province. The lack of rain has resulted in the failure of the food crops in some parts, and the Government have had to take famine-relief measures in the most seriously affected areas. Land prepared for cotton in some parts was sown with food crops, but in many such cases the additional acreage added but little to the food supplies owing to drought.

The cotton crop has been fairly successful on the whole, the output being estimated to be 125,000 to 130,000 bales.

In January last the railway extension was opened ; this runs from Tororo near the Kenya border to Mbulamuti on the short line which connects Jinja on Lake Victoria with Namasagali on Lake Kioga. From Tororo the line runs to Nakuru where it connects with the old main line of the Kenya-Uganda railway. The extension recently opened runs through an important cotton-growing part of Uganda, which will thus be put into direct connection with the sea at Mombasa.

In accordance with the sliding scale now in force, the cotton tax for 1928 is six cents per lb. of lint, as compared with two cents last year. The railway rates of cotton, which were reduced by 25 per cent last year have reverted to the rates ruling in 1926 : the shipping companies on the other hand have not reverted to the old rate of 45/- per ton, but to 40/- per ton only.

By permission of the Uganda Government the account of the cotton experimental work was again included in the Corporation's annual volume of reports. The season 1926-27 unfortunately proved disastrous to the selection work. Severe hail was followed by excessive rain in October and November, causing heavy shedding which was aggravated by very dry conditions in December and January. This dry spell favoured attack by jassids, which completed the catastrophe. It is satisfactory to record, however, that progress has been made in the multiplication of a selected strain known as N.17, and this seed will be distributed in parts of the Northern Province this year, as well as through the whole of Busoga and most of the Teso and Lango Districts. Its further extension is under consideration.

The Corporation presented a type of pulverising harrow to the Agricultural Department, and the reports on its working have been entirely satisfactory. Some modifications have been suggested which are calculated to adapt it better to native use, and an endeavour is being made by the Agricultural Department to get the local implement agents to stock a number of these harrows for sale to native cultivators at reasonable prices.

The crop harvested in 1927 amounted to 16,650 bales only, as compared with 24,280 bales in 1926. This reduction is attributed by the Agricultural Department to a reduction of acreage following on the low prices received by cultivators in the autumn of 1926. In Tanga Province the crop has been given up as being unsuited to the district. It has also been given up in Mahenge and Iringa Provinces, owing to their remoteness from railways. There was an increase, however, in both the Morogoro and Kilosa Districts. Reports of the position at the middle of February this year were to the effect that the weather was still dry in many parts, and that cultivators were waiting for rain before planting.

The Report of the Agricultural Department for 1927 contains much interesting information concerning the development of the cotton-growing industry, and of the work that is being carried out at the Cotton Experiment Stations. The Department are continuing the work initiated by the Corporation's former cotton specialist in the direction of improvement of the quality by selection. In the North-western portion of the Territory it has now been possible to eliminate the old seed completely, and to replace it by stocks of seed multiplied from Uganda importations.

Experimental work on cotton is being carried out by the Agricultural Department at Morogoro and Mpanganya, the experiments including variety trials, and tests of various cultivation methods such as time of planting and distance between plants.

When the Governor, Sir Donald Cameron, was in this country last summer, advantage was taken of the opportunity to discuss with him directions in which the Corporation might assist the cotton-growing industry in Tanganyika. As a result it was decided to allocate a sum not exceeding £6,000, to be spread over three years, in connection with such development work in Tanganyika as may be approved by the Corporation, and in the first place on ploughing schemes which are being

carried out in certain districts. These schemes are being placed under selected District Officers in whom the Governor has every confidence. A letter received from the Governor only last month, while thanking the Corporation for their offer, states that the Government will be able to finance these ploughing schemes without financial help.

The personnel of the Agricultural Department is being increased, and the Director is anxious to appoint certain cotton investigators in addition to the ordinary agricultural officers. These would be posted to the agricultural Stations, and their duties would presumably consist mainly in experimental work. The Corporation have expressed the hope that it may be possible to place the cotton investigators on appointment under men experienced in this kind of work. Alternatively they have offered to allow them to spend a preliminary year at the Corporation's Plant Breeding Station at Barberton in the Transvaal before being posted to Experiment Stations in Tanganyika.

It is believed that the new additions to the Agricultural Department will include three former holders of the Corporation's Studentships, and one who was a junior member of the staff in South Africa, although not previously a holder of a Studentship.

One of the chief necessities for the further progress of the cotton-growing industry in Tanganyika is a higher average yield per acre, and it is to be hoped that the increase in the agricultural staff will enable the experimental and development work to be sufficiently thoroughly supervised to allow improvement in this direction to be effected, although the rigorous control of the seed supply by the Department would seem to be a necessary preliminary step to ensure that the scientific selection work may not be rendered of no effect.

NYASALAND.

Experimental work was continued at the Experiment Stations at Makwapala and Port Herald, which are financed jointly by the Corporation and the local Government. The

former Station is representative of conditions in much of the area in which European settlement has taken place, while Port Herald, being at a lower elevation, provides results that can be applied to the lower lying areas in which native cotton-growing is being fostered. At Makwapala the highest yield yet recorded was obtained last season, 222 lbs. per acre of clean lint having been obtained from an area of 2½ acres planted under a selection from the " Over the Top " variety introduced from America by Mr. Sampson. At Port Herald, a yield of 216 lbs. per acre, again from a 2½ acre field, was obtained from a strain derived from the Foster-Whitehall variety, the staple length being between 1⅛" and 1$\frac{3}{16}$". These yields constitute a considerable advance, a very usual average Nyasaland return being some 60 lbs. of lint per acre. Further trials were made of a number of crops which should be suitable as rotation crops with cotton. This work is particularly important in view of the present lack of rotation crops that are sufficiently valuable to stand the high cost of transport from the Protectorate.

Mr. King, the Corporation's cotton entomologist in Nyasaland, continued his efforts to evolve control measures to minimise the effects of red boll worm attack. He found that after expending an extra 4s. an acre on catching the moths of this pest the yield per acre this season was approximately three times the average for the last six years. Further work on these lines is being carried out during the current season. Full reports on the work carried out at Makwapala and Port Herald, and by Mr. King, have appeared in " Reports received from Experiment Stations, 1926–27."

Mr. Lawrence, the Farm Manager in charge of the Port Herald Station, is due to arrive in this country in August and will, as the holder of a Studentship, spend a year's study leave at the Imperial College of Science, with a view to improving his technical qualifications as a preliminary to a further term of service in Nyasaland.

This season cotton has practically disappeared as a European grown crop, owing to the poor results obtained in past years coupled with the competition of tobacco. There

is, however, an increased interest this season in the possibilities of cotton as a rotation crop to be grown in conjunction with tobacco, and a number of planters are trying small acreages of cotton sown with "Over-the-Top" seed supplied from Makwapala; it is, of course, too early as yet to say with what success. The large cotton estates on the Lower Shire have reduced their acreages very considerably but are experimenting with seed stocks of "Over-the-Top" and "Foster-Whitehall," supplied by the Port Herald Station.

Reports from the Lower and Central Shire areas indicate that seed distribution to natives is normal to date. Planting however, is not yet in full swing on the Lower Shire, and it will depend on the March–April rainfall what acreage is ultimately sown. One very pleasing point is the evident keenness this year of the natives to grow cotton.

Approximately two tons of "Over-the-Top" seed have been issued to native growers in the Lisungwe and Dedza districts, and a start is being made to distribute "Foster-Whitehall" seed on the Lower Shire. This "Foster-Whitehall" is a desirable type of long staple cotton which gave good results at Port Herald last season. The bulk of the seed issued is still, however, Nyasaland Upland.

It is quite impossible as yet to say what the crop will be. In the event of good March rains falling in the Lower Shire areas, prospects are distinctly good, but without them a partial failure is to be expected.

NIGERIA.

The Director of Agriculture reported that for the year ended 30th September, 1927, the total cotton exported amounted to 27,464 bales of 400 lbs. each. This reduction was due mainly to climatic conditions in the Northern Provinces, which were the worst on record for the past twenty years. Their effect will also be felt to a certain extent during this season, as the main preoccupation of the farmers was to replenish their depleted reserves of guinea corn. Happily

there were good rains in this area in 1927, and an ample supply of corn was harvested, thus averting any danger of famine.

The Assistant Director and Mr. F. L. Engledow, of the School of Agriculture, Cambridge University, visited Nigeria during January and February this year, and had an extremely interesting and satisfactory visit, thanks to the excellent arrangements made for them by the Nigerian Government and particularly by the Director of Agriculture and his staff. Their report and recommendations in connection with the important part played by the Corporation's farm in seed multiplication and distribution will be published in due course.

In the Southern Provinces they were able to study a very interesting system of seed multiplication of Ishan cotton, (*G. vitifolium*), by which the Department of Agriculture were able to sow about 1,400 acres with 3,000 lbs. of seed harvested last season. Unfortunately weather conditions have been bad in the South, and the rate of multiplication will not be as good as was hoped. On the other hand Ishan cotton has stood the test of drought better than the ordinary native cotton (*G. peruvianum*), and there is every prospect that the farmers who have seen the former cotton will be anxious to obtain seed of it.

In the North there was a good crop of cotton which, at the beginning of the season, was brought freely to the cotton markets. The price fell, however, during January and February, and consequently there were indications that a large proportion of the later pickings was being held up or sold for local consumption, and the Director of Agriculture estimates that the total amount exported from the Northern Provinces will not exceed last year's figures of 16,000 bales.

The Corporation's seed farm at Daudawa, which consisted of 120 acres of cultivated land last year, had, in the season 1927–28, 220 acres under cultivation, of which 100 were under cotton. By the middle of February picking had been completed on 60 acres, and the yield was 440 lbs. of seed cotton to the acre. As the land has not yet felt the effect of green

manure or good cultivation: this can be regarded as a very satisfactory harvest, and compares very favourably with the 280 lbs. per acre of last year. It is hoped to clear and cultivate another 100 acres next season, but it is not yet certain to what extent it will be possible to increase the acreage by the present system of hired hand labour. The present labour staff is good, and a number of men have been for over a year on the farm. This indicates that they are content with their conditions.

The water supply, which is practically complete, will undoubtedly attract labour and co-operating farmers, who have hitherto had to carry their water supply for two miles or hire other labourers to do it for them.

At present only three co-operating farmers have taken up land. As they have got very good yields of cotton per acre (about 450 lbs.) it is to be hoped that they will be satisfied and will become propagandists of this scheme which is exciting considerable sympathetic interest in various Government Departments.

The 40-saw gin and engine have been set up. Unfortunately it was not possible to obtain the temporary services of an engineer, and therefore the Assistant Director did not see the gin in operation.

At the request of the Director of Agriculture the Corporation have obtained from the United States small quantities of seed of certain specified varieties which he was anxious to use for experiments in connection with the possibility of substituting another variety for Allen, the type at present grown in Northern Nigeria.

We are informed by the Director of Agriculture that only a small crop is again to be expected this season. One of the chief reasons for this has already been mentioned, namely the natural inclination of farmers to plant more guinea corn and less cotton, owing to the high price of the former and the low price of the latter last season, magnified, no doubt, by propaganda by Native Administration officials who not unjustifiably feared a famine. A reduced acreage was planted in the

Southern Provinces also, and there the crop which looked promising up to November suddenly went off badly, as happened in 1922–23. The improved Ishan cotton did fairly well at Meko, and it is hoped that at least twenty-five tons of this seed will be available for distribution. If there is any deterioration this season in the quality of this cotton the Agricultural Department are of opinion that it is no more than would be explained by the poorer season.

SIERRA LEONE.

The Assistant Director and Mr. Engledow were able to land at Freetown on both their outward and homeward journey, and therefore had opportunities of discussing briefly agricultural problems with the Governor, Sir J. Byrne, the Chief Secretary, and Headquarters of the Agricultural Department. Mr. Dawe, the Commissioner of Lands and Forests and Director of Agriculture, who initiated the experiments in connection with cotton in Sierra Leone, has unfortunately been invalided, and had left the country before their arrival.

Experiments in selection of the local Quande cotton are being continued, and a small quantity of Ishan seed from Nigeria is being sown, but hitherto the results have not been very promising. The rainfall in most areas where transport facilities and communications are good is so heavy that the great problem is to limit erosion of the soil.

At the request of the Commissioner of Lands and Forests, in order to assist the Agricultural Department in their experiments to find a suitable type of quick-maturing cotton, the Corporation obtained small quantities of various kinds of seed which were sent to Sierra Leone for trial. It is hoped that the Department will in due course inform the Corporation of the results obtained.

It is possible that eventually a cotton may be discovered that will flourish, but it may prove that the agricultural future of Sierra Leone is to be found in the cultivation of some perennial crop such as oil palms or cocoa.

GOLD COAST.

The Assistant Director and Mr. Engledow also paid two very brief visits to Sekondi and Accra, where they saw the Chief Secretary, Mr. Knowles, the Director of Agriculture, and Mr. Auchinleck, the Assistant Director. Climatic conditions in the Northern Territories are somewhat similar to those of Northern Nigeria, and it should therefore be possible to grow cotton of better quality than that which is now grown for internal consumption.

At present, however, the natives in those areas which are fairly densely populated, are interested only in cocoa plantations, which have made them rich, and consequently unwilling to work for wages. Where labourers are required they have to be recruited from the Northern Territories, which have a very small population. Unless and until it becomes practicable to keep these northern tribes on the land, the prospects of growing cotton for export do not seem very promising.

At the same time it is obvious that the present dependence of the Gold Coast on one crop is not a satisfactory state of affairs. This is fully realised by the Government, which is considering the general agricultural position most carefully.

WEST INDIES.

There still continues to be a very limited demand for Sea Island cotton, with the result that stocks have accumulated both here and in the West Indies. As a consequence, purchasers of cotton have repeatedly urged that there should be a reduction in the acreage planted and this has been effected in some of the islands during the past season, a reduction of nearly 50 per cent being reported in the area planted under Sea Island cotton in 1927-28 in St. Vincent, one of the largest producers. St. Vincent is in a better position than some of the other cotton-growing islands to effect so drastic a reduction, on account of its varied agriculture; arrowroot, sugar cane, cocoa and coconuts are all grown, as well as groundnuts and maize.

In Montserrat, on the other hand, it is understood that some difficulty is being experienced in finding other crops to take the place of cotton. Cotton growers in the West Indies will have to consider whether they can afford to continue to grow Sea Island cotton on an artificially restricted area, and the suggestion has been made that another type commanding a wider market should be substituted. In selecting such a variety regard would have to be paid to its high-yielding capacity, seeing that it would almost certainly sell at a lower price than Sea Island and would therefore have to possess compensatory advantages in order to appeal to growers. The Commissioner for Agriculture has pointed out that, if any change is made to another type, it will have to be made Island by Island, and the preliminary trials necessary before a new type can be recommended will take several years.

FIJI.

The Fijian Islands are the only cotton-growing part of the Empire, except the West Indies, in which Sea Island is the type chiefly grown ; in fact, up to the present, no other type has been exported. The Corporation's officer is carrying out experiments with several other types, with a view to finding a variety commanding a readier market, and some interesting results have been obtained on experimental plots from some Kidney cottons, the seed of which was sent out by the Corporation from some single plant selections made by Mr. Evans in New Guinea. It is hoped to carry out spinning tests on the lint from this type this season. Meade and Pima have also been tried, but without success. At the request of the Department of Agriculture the Corporation have also recently supplied for trial some Tanguis seed. The cost of transport of cotton from Fiji is naturally heavy and, in order to be a commercial success, a type can only be established which gives a satisfactory financial return to the growers.

The season 1926-27 was exceedingly wet and a considerable reduction in acreage was anticipated during the present season.

Mr. Anson, the Corporation's officer in Fiji, is of opinion that the industry could be best developed if some form of closer settlement in certain proved areas suitable for cotton could be arranged by the Government. He indicates the Sigatoka Valley as being particularly suitable for this purpose. He also advocates the introduction of some other marketable crop to be grown in rotation with cotton.

CEYLON.

The efforts of the Government to establish cotton-growing as an economic crop, more especially in the Hambantota district, have been continued and have met with moderate success : about 1,000 acres were under cultivation in 1926-27. The Agricultural Department are laying stress on the importance of making cotton a part only of a proper system of rotation including food and other crops. The whole crop is purchased by the Government at a price which, last year, it was estimated would involve a loss. Among the chief requirements are stated to be an earlier maturing type of cotton, and work with rotations ; investigations in both of these directions are being carried out at the Government Experiment Station.

CYPRUS.

There was a notable increase in the production of cotton in Cyprus in 1927, the output amounting to 7,029 bales. In the last Annual Report it was stated that any increase in the area devoted to the crop appeared to be dependent on irrigation. In January last a report from the engineers who had been investigating this question was received, from which it appeared that there are fairly large areas where moderate supplies of water can probably be obtained from bores below the sources tapped by native wells, while there are some areas from which very large volumes of water could be pumped the whole year round. The Morphou district, in particular, seemed especially promising.

A request has been submitted to the Governor for further information as to the action which the Government is prepared to take in carrying out irrigation work, and as to the rate at which they would be prepared to sell such water to cultivators. This and other questions will have to be settled before the time is ripe for acceding to the Governor's request that the Corporation should send out an expert to establish an experiment farm. Until all the preliminaries for organising agriculture by irrigation have been settled by the Government, it is felt that little assistance could be given by an expert cotton agriculturalist. On the other hand, in a scheme of any size for agricultural development by irrigation, an experiment station must form an integral part, for as soon as irrigation is undertaken, many scientific problems arise that need to be solved. The Government has been assured that if they are prepared to embark on such a scheme, the Executive would consider a request for assistance in this direction.

RESEARCH.

Imperial Agricultural Research Conference.—This Conference, which met in October last, was attended by representatives from practically all the self-governing Dominions, Colonies and Dependencies of the Empire, as well as by delegates from this country. The Corporation were represented by Sir William Himbury, Sir James Currie and Mr. S. Milligan. It is hoped that the Conference will prove to have been a most successful experiment, and that its results will be reflected in closer co-operation between the research workers in various parts of the Empire, and particularly in the Tropics, in which the Corporation are more especially interested.

The Conference recommended a scheme of tropical Research Stations, and it defined in general terms the needs which they were to meet. At the same time, it laid down the principle that such Stations should not be chosen on account

of geographical or political considerations, but should have reference to the actual agricultural needs of the different parts of the Empire.

Another recommendation in which the Corporation, hoping as they do for increased production of irrigated cotton in the Sudan, will be specially interested is that the Civil Research Committee of the Cabinet should appoint a special Sub-Committee to deal with irrigation, and to decide where a Research Station for that subject should be situated. It is understood that this Committee has since started work.

The Conference also discussed the possibility of creating and improving means for the collection, cataloguing and dissemination of information on specific branches of scientific agriculture. This work is successfully carried on at present in their special subjects by the Imperial Bureaux of Mycology and Entomology, and the Corporation have consistently devoted a large proportion of the *Empire Cotton Growing Review* to similar work. The numerous reference that have been made to these abstracts by members of Agricultural Departments on leave have been gratifying evidence that this section of the Journal is carefully read and its objects fully appreciated.

Cotton Research Station, Trinidad.—With a view primarily to enabling members of the Corporation to acquire a general knowledge of the type of work that is being carried on at the Research Station in Trinidad, articles were published in October last in the *Empire Cotton Growing Review* describing in as non-technical phraseology as possible the kind of investigations that are being carried out both in the Genetics Department and in the Physiology Department. A paper by Dr. Mason and Dr. Maskell, the Corporation's plant physiologists, dealing with the transport of sugar in the cotton plant, was recently published in the *Annals of Botany* in two parts. Evidence of the wide interest taken by scientific workers in this subject is afforded by the fact that the Corporation distributed nearly a hundred

copies of a reprint of this paper. The decision to make this problem the first physiological investigation was taken by the staff because they were convinced that problems of more apparent immediate bearing on cotton production, such as shedding of buds and bolls, the method of cellulose formation in the lint and the variation in habit and plant development as the result of climatic and other causes, could not be attacked until more information was available relating to the machinery responsible for the transport in the plant of sugar, the condensation of which to cellulose is the origin of the cotton hairs. Armed with the knowledge acquired from this work, the Corporation's staff state that they are now in a better position to investigate with some hope of success the causes responsible for the production of thin-walled hairs and the shedding of flower-buds and young bolls.

This year research has also been in progress in the Physiological Department on the transport of nitrogen. It has been found that though the mechanism of transport is fundamentally similar to that of sugar, yet there are many important differences. It is surprising how important nitrogen is in the production of the cotton, for though but little is utilised in the manufacture of the lint, yet the other parts of the boll tend to drain the rest of the plant of nitrogen to such an extent that growth is brought to a standstill. As the supply of nitrogen is so generally short in tropical soils, the investigators have in view the more economical utilisation of nitrogen by the plant and a survey of the methods at present used in maintaining the nitrogen supply of the soil. It is hoped that a full report of this work on the rôle of nitrogen in the economy of the cotton plant will appear in the *Annals of Botany* before the close of the year.

Work has also recently been begun on the immunity of cotton to Internal Boll Diseases. It is probably not an overstatement of fact to say that the most important single factor limiting the production of cotton in Tropical Africa is the damage incurred as a result of Internal Boll Diseases. The part played by the cotton stainer in carrying the fungi of the

Internal Boll Diseases is now well known. Though no success has yet been achieved in producing a cotton immune to stainer attack, yet no attempt has hitherto been made to evolve a type immune to the fungi carried by the stainer. The staff of the Department are investigating by means of a new method the variations in the resistance of cotton to some of these diseases.

Experiment Stations.—The annual volume of Reports from Experiment Stations, 1926–27, was published in February last. It contained reports from Stations in Queensland, the Union of South Africa, Swaziland, Southern Rhodesia, the Sudan, Uganda, Nyasaland and Fiji, together with a report on the Corporation's Seed Farm in Nigeria.

These reports provide a comprehensive survey of the systematic work that is being carried on at these Stations, with a view to determining the conditions under which cotton can best be grown in each locality and the properties which a cotton should possess if it is to thrive there. At some Stations the work is directed mainly to breeding a type that is resistant to a specific pest, as illustrated by the remarkably encouraging results achieved by the Corporation's plant breeder at Barberton in the Transvaal. Work along similar lines is being carried on in Southern Rhodesia. In other areas the chief problem is to find a type that will produce a profitable crop in spite of attacks by the red boll worm ; there are indications that a solution may be found in breeding a type which matures quickly from the flowering stage. Again, in the Sudan, investigations are proceeding with a view to determining the varieties that are best suited to the conditions of those parts of the country where the crop can be grown under rainfall, thus laying the foundations of what it is hoped will grow into an important new industry, providing a substantial output of cotton suitable to the needs of spinners of American cotton, and simultaneously bringing wealth and a higher standard of civilization to the backward races of the Southern Sudan.

At other Stations experiments are in progress on cultural methods, including such points as the optimum time of planting and the best spacing of plants. The value of various other crops as rotation crops with cotton is also being explored at several Stations, the results of which cannot fail to benefit the general agriculture of the several countries in which the trials are being conducted.

The adequate staffing and equipment of these Experiment Stations for the important work that they have to carry out have always been regarded by the Corporation as perhaps the most important of their activities. They have consequently naturally represented the principal items in the Expenditure Account.

The Lancashire cotton industry have thus shown their belief that the surest way of safeguarding the supply of their raw material and of ultimately stabilizing its price by extending the areas from which that supply is drawn, is by patiently elucidating the scientific problems governing the various conditions under which cotton can be grown under the influence of different climatic factors. It is only by collecting and disseminating the knowledge thus acquired that the foundations can be securely laid for what it is confidently hoped will become a steadily expanding industry. The work, even at this early stage, is beginning to show results which are most encouraging for the future, and if the Corporation needed vindication for their policy, it is to be found in the fact that other industries dealing with tropical and sub-tropical crops are now following their example in devoting considerable sums of money to investigations relating to their raw materials and improved efficiency in their production.

Home Universities and Research Institutions.—The Corporation wish to take this opportunity of expressing their appreciation of the action taken by the University of Cambridge in acceding to the Corporation's request and giving leave of absence to Mr. F. L. Engledow of the School of Agriculture, in

order that he might visit Nigeria in company with the Assistant Director, Colonel French. Mr. Engledow's visit was much appreciated by the Governor and by the Director of Agriculture, and it is confidently hoped that his discussions with members of the staff of the Agricultural Department will be productive of valuable results, more especially in the formulation of an improved system of seed selection and distribution, while in general the opportunity such a visit affords to the agricultural staff of keeping in touch with the lines which scientific work is following at home cannot fail to be of considerable mutual benefit.

At the University of Manchester the Mycological Department were chiefly engaged on an investigation of the fungus *Asochyta gossypii*. The fungus was cultivated on cotton plants in the greenhouse of the University Experimental Grounds, where the bolls ripened quite successfully, in spite of the sunless summer. The investigation is almost ready for publication.

In the Entomological Department the principal investigation was directed towards a study of the conditions under which thrips attack the cotton plant. Papers have been published dealing respectively with the relations between (*a*) degree of infestation and water supply; (*b*) temperature and life history of thrips in a saturated atmosphere; and (*c*) feeding habits and plant lesions. During the coming season it is intended to study the relation between the clay content of the soil and the degree of infestation.

The Botanical Department of the Imperial College of Science and Technology is particularly concerned with the training of men for mycological, plant physiological and plant breeding work overseas; it is in addition carrying out several specific investigations on cotton. It has recently supplied to the Corporation a report on the sulphuric acid process of delinting cotton seed. This process has the great advantage of removing the lint and softening the seed coat and so hastening the process of germination; it also sterilises externally by

charring the surface of the seed. There was some doubt, however, as to whether the treatment might not be injurious to seeds of certain strains or to seeds which have already been somewhat affected by parasites. These points were studied on a wide variety of material and the report shows that the germinating capacity of all varieties and qualities is unimpaired by the treatment. The College has also tested for the Corporation the germinating power of a sample of cotton from Karkar Island, New Guinea. Further, it has under investigation strains of the organism producing cotton-wilt, and the effect of environmental factors on the incidence of this disease is being studied.

At Rothamsted the soil conditions affecting the yield of the cotton plant are being studied. The fertility of the soil and its moisture supply are two of the most important factors controlling the yield of cotton. They operate in all areas but are of paramount importance in the Sudan Gezira because the soil is heavy, alkaline in reaction, and its nitrogen content is abnormally low. Special attention has been given to this problem by the Corporation's physicist at Rothamsted since his six months' visit in 1926–27 to study the actual conditions. The problems arise from the fact that the usual methods of meeting nitrogen deficiency—addition of organic material such as farmyard manure or the ploughing in of a green crop —are not at present applicable in the Gezira, and some alternative method must be used to encourage nitrification in the soil. The only feasible way is to adapt the methods of irrigation and of soil cultivation to obtain the maximum direct mechanical improvement of the tilth of the soil that is possible under irrigation conditions.

To this end investigations on the physical and chemical properties of soil and their relation to water supply have been extended in order to ascertain what are the best conditions at which cultivation methods, drainage, amounts and rates of supply of irrigation water, etc., should aim. Laboratory and field methods have been devised for measuring these soil properties; certain of them are connected with the

resistance of the soil to the passage of cultivation implements, measurements of evaporation and percolation of soil moisture, soil structure and soil alkalinity.

The laboratory investigations have been based on a large proportion of tropical and sub-tropical soils. The samples have been carefully taken by local officers, and full information is available on their agricultural characteristics.

Full information has also been collected on soil deterioration and crop conditions from each part of the Empire where irrigation is practised and also from selected areas in foreign countries. This will prove of great value in assessing the relative urgency in different areas of the various fundamental problems of soil tilth and fertility under irrigation conditions that are now being investigated at Rothamsted.

In the past year the new greenhouses, the gift of the International Education Board, have been taken into use, and it has become possible to study plant disease under controlled environmental conditions. A beginning has been made with the investigation of "black-arm" of cotton (*B. malvacearum*).

STUDENTSHIPS.

Eleven men completed their training last July as holders of Studentships under the Corporation. Of these, four entered the service of the Corporation, and are at work in South Africa. Two South African students, after completing their year in Trinidad, returned to the Union and have since taken up posts under the Colonial Office in Tanganyika Territory. Two further men secured appointments in the Colonial Service, one as a Chemist in the Nigerian Agricultural Department, and the other as an Economic Botanist in the Gold Coast. The Sudan Government offered an appointment to one of the remainder, one obtained a post with the Forest Products Research Board, and the last, Mr. Moffat, after a year's training at the Experiment Stations in Nyasaland, has been appointed

to Northern Rhodesia, as mentioned above, his salary being shared equally by the Corporation and the local Government.

For the year 1927–28, six senior and seven junior students were elected out of 45 applicants. The seniors were all men who had held junior studentships in the previous year, and they are now undergoing their second year's training at the Imperial College of Tropical Agriculture, Trinidad. Of the juniors, five are at Cambridge and two at the Imperial College of Science, South Kensington.

During the year a number of the Directors of Agriculture of Colonies in which former students have secured appointments have reported very favourably on their work. That they benefit considerably from the special training they receive under the Corporation is indicated by the fact that one officer, after three years' service in Uganda, has been appointed head of the Genetics Department at the Amani Institute. Another after two years as an Agricultural Officer in Nigeria, has been selected to fill a vacancy in the botanical staff in that Protectorate. Another officer has been appointed Geneticist in Iraq after serving with the Sudan Plantations Syndicate.

For the year 1928–29 the Executive Committee have authorised the offer of a maximum of twelve Studentships if suitable candidates present themselves.

IMPERIAL COLLEGE OF TROPICAL AGRICULTURE.

In view of the generous contribution which the Corporation made last year to the College, members will have been gratified to read a few months ago that the Director, Sir James Currie, had been appointed Chairman of the Governing Body of the College in succession to the late Sir Arthur Shipley. The importance of this post and of the work of the College is evident, having regard to the fact that the great majority of men joining the Agricultural Departments of the Crown Colonies receive their post-graduate training at the College under the Colonial Office agricultural scholarship scheme. Consequently it is of the highest importance to the objects of the Corporation that the College should function efficiently, and that the

training there given should be on the right lines. In this connection it may further be mentioned that Mr. G. Evans, for some years a member of the Corporation's staff, has been appointed Principal during the past year, while Mr. R. C. Wood, formerly the Corporation's Cotton Specialist in Tanganyika, and latterly in Swaziland, has been released from his engagement to take the post of Professor of Tropical Agriculture at the College.

During the present year all the holders of the Corporation's Senior Studentships, six in number, are studying at the College.

SPINNING TESTS.

The value attached to the results of spinning tests and brokers' reports is again evidenced by the large number of samples submitted to the Corporation for this purpose during the past year. These have been received from the following countries :—Nigeria (13), South Africa (7), Fiji (4), Uganda (7), Tanganyika (21), and the Sudan (65)—a total of 117 samples.

The large number of samples from the Sudan call for special mention. Fifteen samples represent different dates of picking of five different varieties of American cotton grown under irrigation, 15 are from different pickings of the same varieties grown under rainfall, while 19 are the result of a date-of-sowing experiment of Egyptian cotton grown under irrigation. One of the objects of Mr. Bailey, the Corporation's plant breeder, in designing these experiments was to ascertain whether the cotton maintained its spinning qualities reasonably well up to the latest picking date. The results of these experiments may have an important bearing on the general practice to be followed when growing irrigated cotton, because if there is shown to be any substantial deterioration, it might be that it would be more economical to reduce the number of waterings and discontinue picking earlier and to use the water thus saved in extending the area under irrigation. While on leave last summer Mr. Bailey enlisted the co-operation of the Shirley Institute, and, through them, of the spinners who so

kindly carry out these tests ; in view of the interest attaching to the results, they generously consented to test the samples, notwithstanding their number. The test on the American cottons are of special importance also, in view of the extension of rain-grown cotton in the Sudan, in order to ascertain the effect on the lint of this type due to a complete change of conditions (from northern irrigated conditions to southern rain-crop conditions).

Mention may perhaps also be made of the Fiji samples, which were Kidney cotton, collected in New Guinea by Mr. Evans when a member of the Corporation's staff. The Corporation's officer in Fiji is experimenting, as already mentioned, with a view to finding a cotton for Fiji which commands a wider market than Sea Island, which is the type grown there at present. The spinning test results and the brokers' reports are decidedly encouraging, but the return that such cottons would bring to the growers would naturally depend also on their agricultural properties, especially the yield per acre.

On account of the large number of samples now sent for report and testing, some time necessarily elapses before the spinning tests can be put through ; a change in procedure has therefore been adopted, and the brokers' report, which is usually completed within a few days of the receipt of the sample, is despatched forthwith to the sender of the sample. It is hoped that this will frequently give him sufficient information to enable him to judge which strains can definitely be rejected in the following year's planting should the spinning test report and that on the measurable characters of the lint hairs not reach him in time.

The Corporation are glad again to record their gratitude—to which they feel they may confidently add that of the Directors of Agriculture and plant breeders responsible for sending the samples—to all those whose ready co-operation has alone enabled the Corporation to render this important assistance to those engaged in the improvement of cotton in the several countries. These include the Federation of Master

Cotton Spinners' Associations and the spinning firms who so generously carry out these tests, the Liverpool Cotton Association and the brokers who are always ready to give expert reports on the samples, the Cotton Research Association, and those members of their staff who carry out the detailed work of measuring, weighing and testing the individual lint hairs. It is the brokers and spinners who are the final arbiters of the fitness of a cotton for the purpose for which it was grown, while the scientific information resulting from examination of the individual hairs is often the means of indicating to plant breeders the reasons underlying a favourable or unfavourable spinners' or brokers' report and of thus suggesting the direction in which improvements must be sought.

MECHANICAL TRANSPORT.

The question of transport in the Colonies received careful consideration in all its aspects at the Colonial Office Conference held last summer. The Corporation submitted a Memorandum on the subject, and the Assistant Director and Mr. Brackenbury were invited to attend the meetings of the Special Sub-Committee appointed by the Conference to consider the problems involved. In their Memorandum the Corporation emphasised the necessity for further experimental work, and suggested the establishment of a representative body which would specialize in the requirements of motor transport in the tropics, particularly in Africa, not only in respect of vehicles and their prime movers but also in regard to roads. The Sub-Committee included these suggestions in their recommendations to the Conference who in turn approved in principle the establishment of a body to be called the Council for Mechanical Transport in the Colonies, on which the Corporation should be represented, and stated that in their opinion the Council should be granted an initial sum of £50,000 and an annual income of £20,000. The Conference in addition approved the Corporation's further suggestion that they should hand over their experimental vehicles to the Transport Council when formed, together with any balance remaining from the sum

authorised by the Executive Committee for expenditure on transport experiments during the financial year 1927–28. The matter has been referred to the Empire Marketing Board, in order that they might investigate both the merits of the proposals and the various sources from which financial assistance might be forthcoming.

Meanwhile the Corporation have continued their experimental work and the Burford Kegresse lorry has been working in Nigeria during the cotton transport season just ended. The other two experimental vehicles have been placed in garage pending a decision regarding the formation of the suggested Transport Council. Exhaustive trials have been carried out with a Tulloch-Reading gas producer unit fitted on a lorry belonging to Messrs. Guy Motors Limited under an arrangement whereby this firm should provide the lorry and pay for the running costs, while the Corporation supplied the gas producer. These trials proving eminently satisfactory, an agreement was reached with the Nigerian Government whereby they would defray three-quarters of the cost of a Guy six-wheeled lorry fitted with a producer gas unit, the Corporation paying the balance. This vehicle is now on order, and after preliminary trials at Aldershot it will be shipped to Nigeria, where it will be used by the Public Works Department on their ordinary work, and possibly afterwards further trials will be conducted by the Mechanical Transport Department of the Nigerian Railways.

EMPIRE COTTON GROWING CORPORATION.

EMPIRE COTTON CROPS FOR NINE YEARS 1919-27, EXCLUDING INDIA.

IN BALES OF 400 lbs.

The seasons are given as covering two years, *e.g.*, 1926-27, because in the majority of the countries named planting takes place in one calendar year and picking in the next. In a few of these countries, however (*e.g.*, Tanganyika, Iraq, Cyprus, Malta), the crop is harvested in the same year as that in which it is planted. In such cases the figures should be read as relating to the crop grown in the *latter* of the two years at the head of the column.*

Country.	1918–19.	1919–20.	1920–21.	1921–22.	1922–23.	1923–24.	1924–25.	1925–26.	1926–27. (Figures in italics are estimates only.)	
(1) Anglo-Egyptian Sudan ...	15,997	23,160	30,519	24,074	28,306	47,652	44,912	121,131	148,118	(1)
(2) Gold Coast	52	—	61	49	15	93	1,132	1,218	285	(2)
(3) Nigeria	17,500	16,200	30,000	15,096	16,811	25,694	39,137	47,909	27,464	(3)
(4) Uganda	36,530	47,694	81,365	48,290	88,046	128,604	196,038	180,859	131,728	(4)
(5) Kenya...	100	100	500	417	1,200	1,653	2,250	2,046	*1,232*	(5)
(6) Nyasaland	2,591	2,026	4,615	5,422	4,036	6,873	7,718	4,976	*2,792*	(6)
(7) Northern Rhodesia	56	35	100	80	102	500	379	506	*363*	(7)
(8) Southern Rhodesia	—	—	—	—	—	1,650	4,907	6,803	604	(8)
(9) Tanganyika	—	—	7,327	7,175	11,434	18,793	21,724	24,280	16,650	(9)
(10) Union of South Africa and Swaziland	1,911	2,737	2,923	2,740	6,523	8,730	16,936	20,381	10,242	(10)
(11) West Indies	6,086	6,170	4,824	4,073	5,160	5,031	4,051	5,148	5,909	(11)
(12) Queensland	31	38	792	3,140	9,344	11,850	14,318	7,179	5,777	(12)
(13) Cyprus	3,325	2,687	2,547	1,505	2,233	3,397	3,320	4,614	7,029	(13)
(14) Malta	343	266	582	193	118	573	782	507	*342*	(14)
(15) Iraq	—	60	60	300	1,100	2,400	2,540	3,500	*1,800*	(15)
(16) Fiji	—	—	—	—	—	83	153	120	797	(16)
(17) Ceylon	—	—	—	—	49	324	121	261	186	(17)
	84,522	101,173	166,215	112,554	174,477	263,900	360,418	431,438	361,318	
		Percentage Increase 19·7	*Percentage Increase* 64·2	*Percentage Decrease* 32·2	*Percentage Increase* 55·0	*Percentage Increase* 51·2	*Percentage Increase* 36·6	*Percentage Increase* 19·7		

* The adoption of this practice for the purpose of giving consistency to the records has necessitated the transference of the figures for certain countries to a previous column. The totals in this table will consequently be found to differ slightly from those previously published.